Applications Note

High Power Probing

Wentworth Laboratories

High Power Probing

The Pegasus™ range of wafer probing solutions addresses today's power semiconductor test challenges by delivering accurate low contact resistance measurements even at high voltages.

High Power

Due to the complexities typically associated with high voltage (HV) or high current (HC) devices, wafer-level testing is usually limited to quality or process characterisation labs or simple setups that are not integrated into the fab's standard test floor activities. Considerations of factors such as instrumentation setup, special cabling, adequate probe station capability and the ability to automation and operator safety, means production probing of these devices faces a number of challenges.

The Pegasus™ series is ideally suited for testing power devices and can be easily integrated with a wide range of tester instruments, e.g. Keysight B1505B. The platform provides a flexible on-wafer probing solution focused on high-power semiconductor characterization.

The Pegasus™ chuck assembly is configured for both HV & HC measurements. A simple mode selection capability enables the system to be turned quickly from HV to HC measurements

Thanks to Kelvin chuck solutions, the prober achieves low contact resistance measurements in the milliohm range even at high currents.

High Current

High current probes and probe cards (up to 200 A pulsed), handle and distribute high current loads. Dedicated HV and HC probes reduce probe and device destruction at high voltages/currents by preventing arcing at the tip. Subject to the number of needles being placed on a pad/structure, along with the test parameters, we can calculate the best needle size to use in either a probe card or manipulator.

PVX Needles (current capability – use as a guide only)				
		Pulsed (pulse time in seconds)		
Tip Dia	**Steady**	**0.1**	**0.01**	**0.001**
0.5	80 mA	100 mA	120 mA	390 mA
1	120 mA	155 mA	492 mA	1.55 A
2	202 mA	622 mA	2.0 A	6.2 A
10*	730 mA	15.5 A	49.2 A	155.6 A
20*	1.4 A	62.2 A	196.7 A	622.2 A

** Radius not possible.*
Ratings for radius tips can vary from 50-80% of an equivalent flat tip rating.

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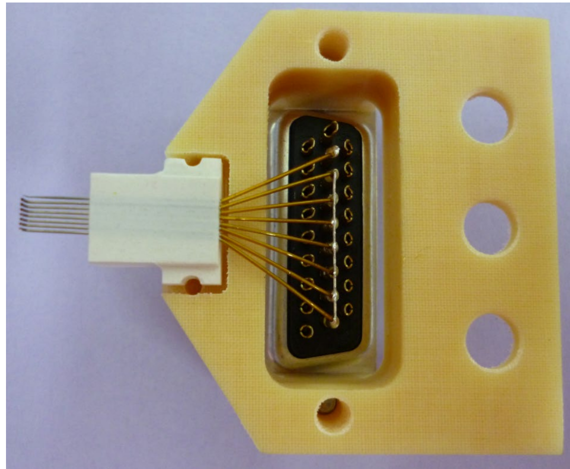
Where manipulators provide the best flexibility for a user's application (R&D, failure analysis etc.) but higher currents are required, an HC needle wedge mounted to a manipulator arm, is an ideal solution.

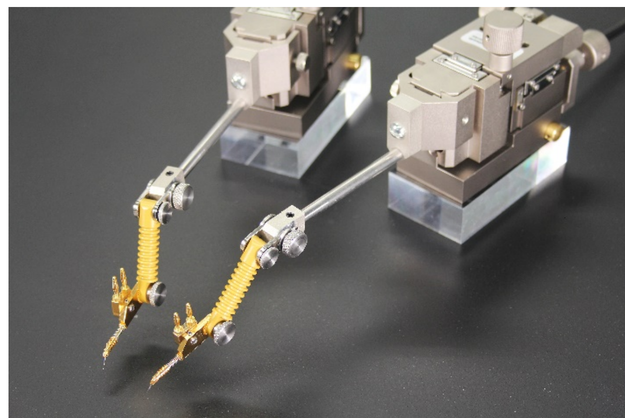


High current wedge card

High Voltage Accessories

Wentworth's Pegasus™ probers can be configured with either high voltage/high current (HV/HC) probe holders or use dedicated HV/HC current probe card solutions.

The needle holder has been developed to greatly increases the surface area to maximize insulation and the proprietary material further increases the safety. Quasi kelvin connections facilitate a force/sense measurement capability minimize the need to re-cable. This provides the ability to be able to measure high current, high voltage, low leakage, on resistance and breakdown voltages in a single measurement sequence. The specification of the Wentworth HV/HC needle holders currently exceeds most commonly available test set-ups.



High voltage/high current probe holders

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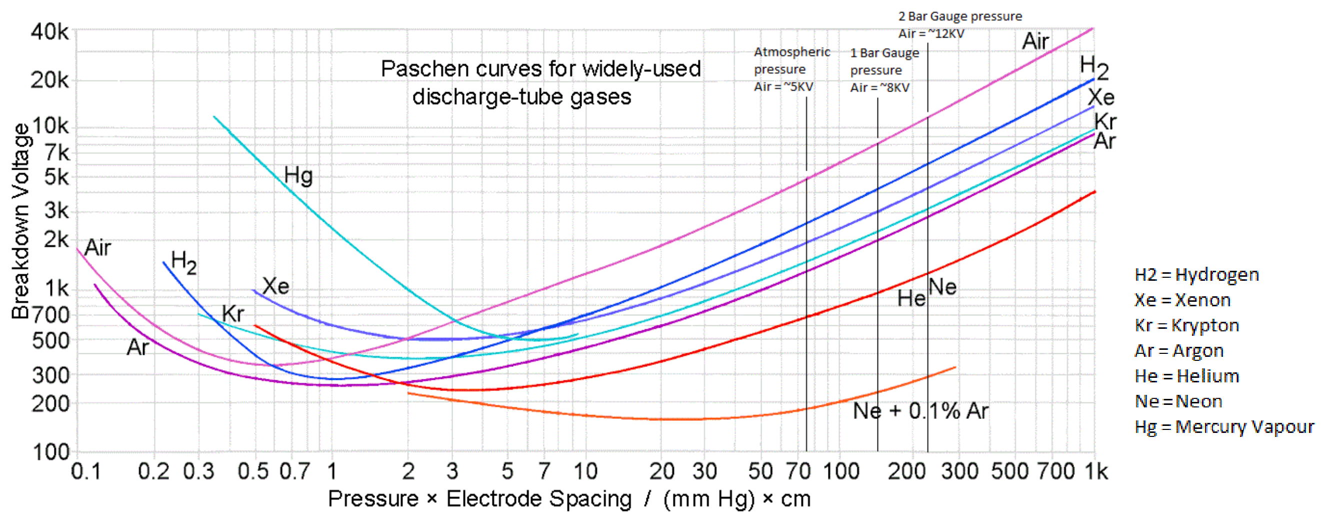
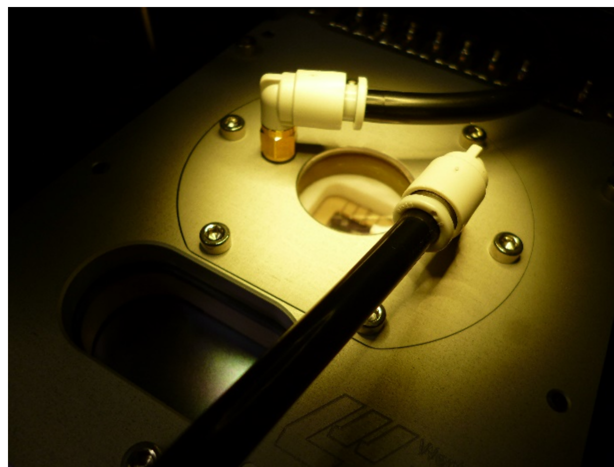
Wentworth's HV/HC probe cards use a special surface mount atmospheric chamber to protect against 'arcing' or 'flash over'.

The chamber design works in 2 ways. Its principle function is based on Paschen's Law. As pressures increase from atmospheric pressure (for any given gas), the breakdown voltage increases which reduces or prevents flash-overs during test.



To concentrate the pressure area, we custom design the lower chamber opening around the probe tips for the exact dimensions of the customer's IGBT, MOSFET or Diode device (Including the street width).

Its secondary function is to act as a purge chamber using nitrogen, dry nitrogen or dry air to reduce flash-overs compared to testing in normal ambient conditions.



Custom high voltage/high current probe card

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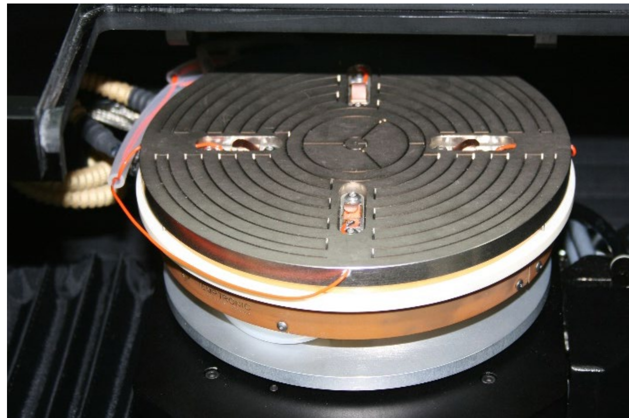
Chuck SPECIFICATION	
Voltage	3 KV (triax), 10 KV (coax)
Current	200 Amps (pulsed)
Leakage	<1 pA (3 KV)

HV PROBE NOISE VS TEMPERATURE	
Temperature	Noise
+25°C	100 fA
+200°C	100 fA

Combine any of the solutions mentioned above with high temperature probe card materials then testing can be performed over a wide temperature range without the need to change the set up.



High voltage thermal chuck

HV/THERMAL KELVIN WAFER CHUCKS	
Specifications	
Temperature stability	± 0.1°C
Temperature accuracy	± 0.5°C
Isolation	> 0.5 TOHM @ +25°C
Capacitance	1600 pF (coax), 200 pF (triax)
Max Voltage	10 KV @ chuck top
Leakage	<1 pA (3 KV)

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